FULL WAVE FORM ANALYSIS AND ECDA REQUIREMENTS

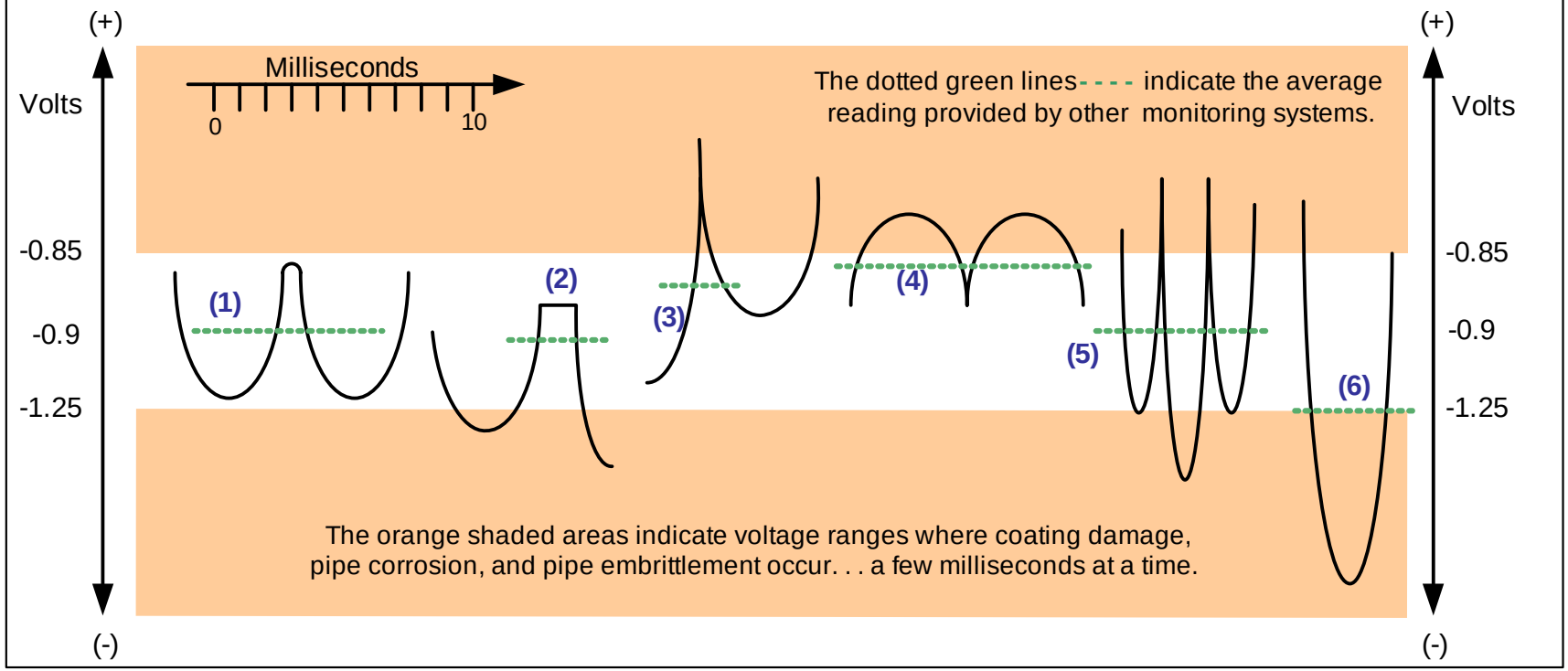
EUPEC RMS RISK MANAGEMENT SYSTEMS

EUPEC RMS
Pipeline Risk Management

What problems are identified via ECDA?

1. **Coating anomalies.**
2. **Interference.**
3. **Rectifiers performing out of specification**

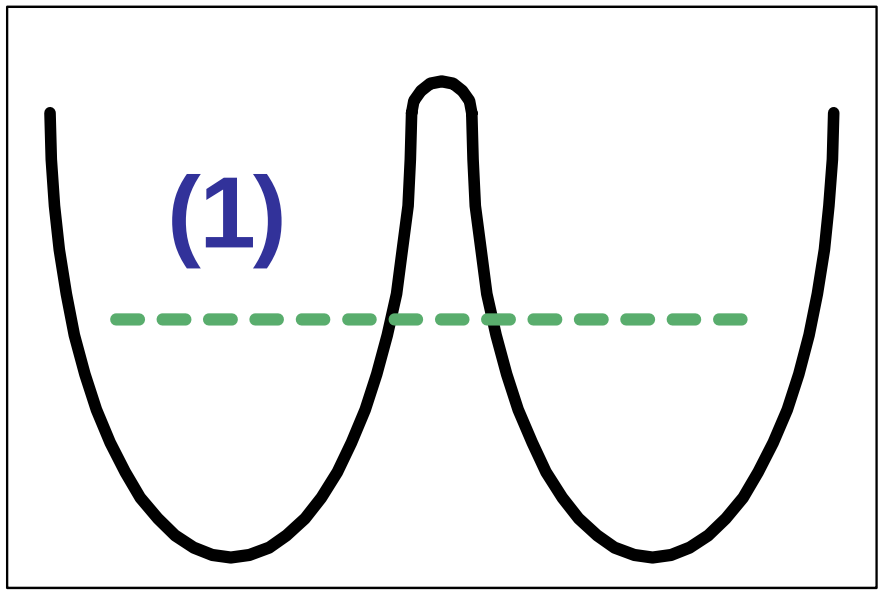
Illustrated below are a few typical cathodic protection signatures. Only EUPEC RMS Cathodic Protection Signal Analysis can identify these signatures.



CP Signal Characteristics

EUPEC RMS RISK MANAGEMENT SYSTEMS

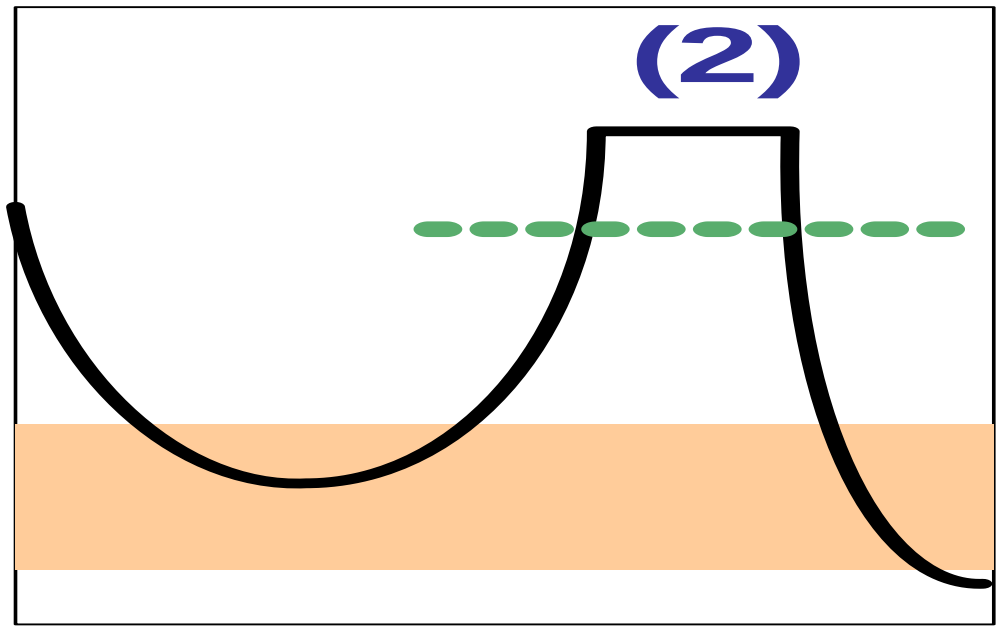
(1) This is the “perfect” cathodic protection signature on a well coated pipeline.



CP Signal Characteristics

EUPEC RMS RISK MANAGEMENT SYSTEMS

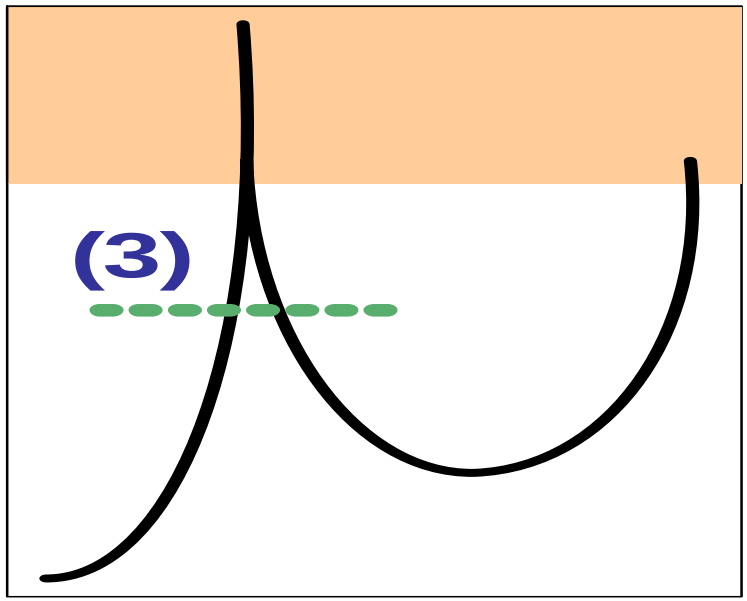
(2) The flat area illustrates the instant-off potential



CP Signal Characteristics

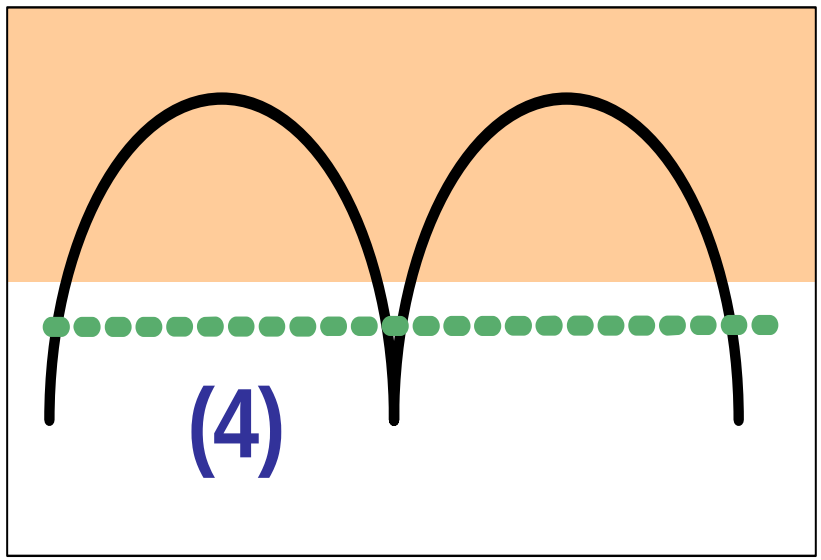
EUPEC RMS RISK MANAGEMENT SYSTEMS

(3) This particular waveform indicates positive spiking. EUPEC RMS is working to determine if corrosion actually occurs during these milliseconds.

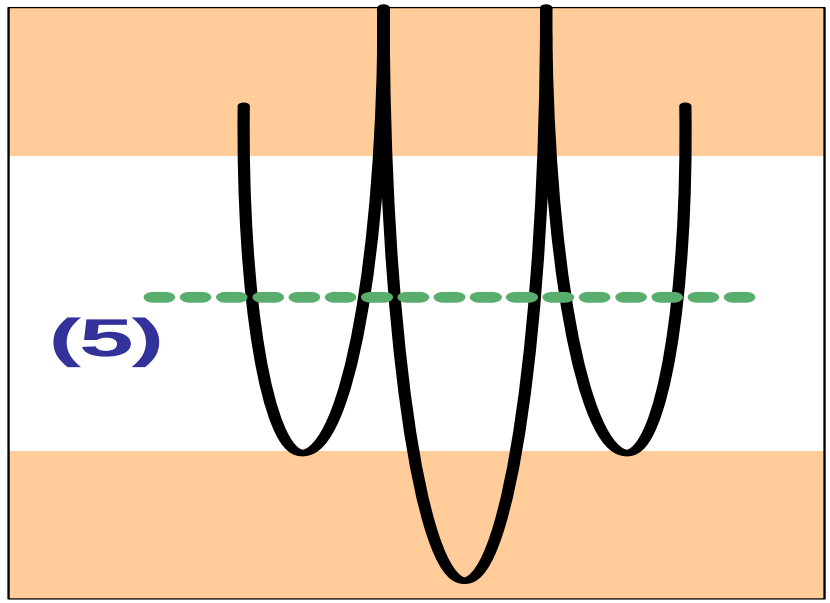


EUPEC RMS RISK MANAGEMENT SYSTEMS

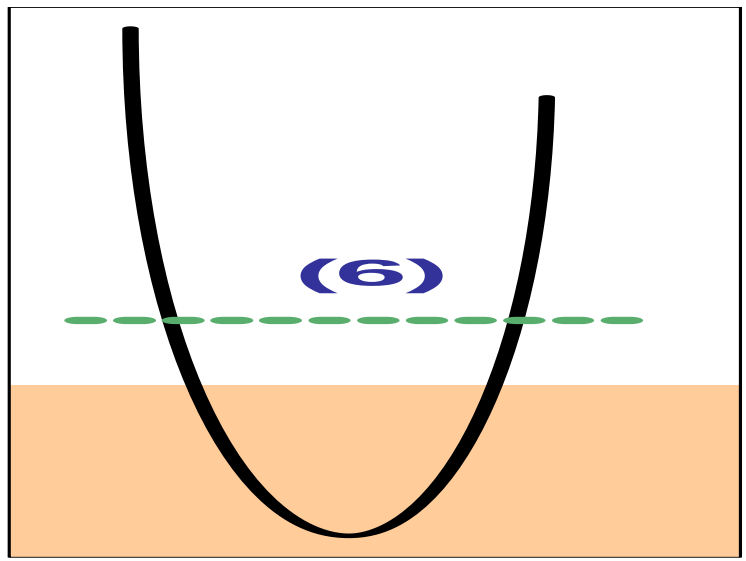
(4) This wave form identifies interference from a foreign source. Note the inverting of of the signal.

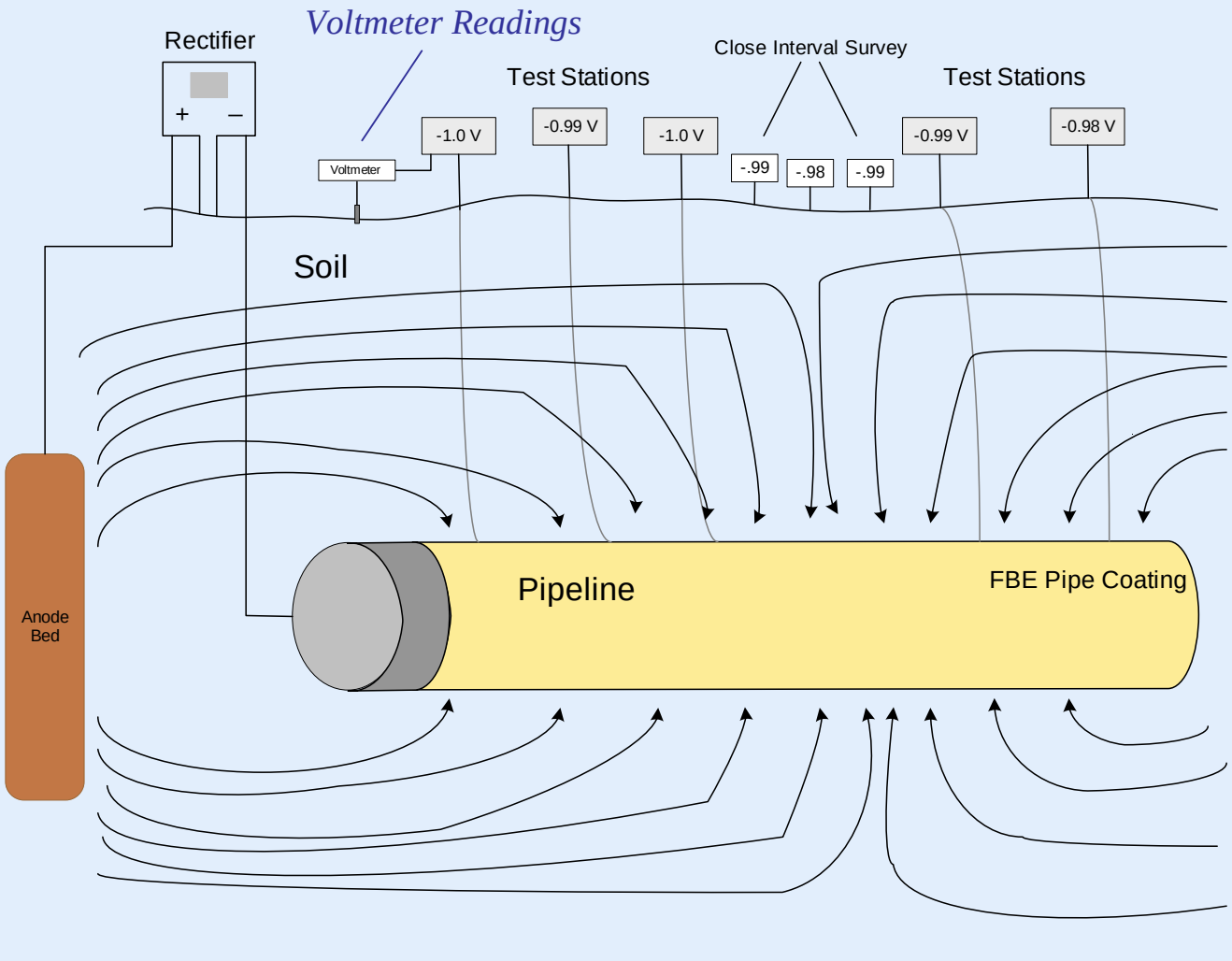


(5) Wave form interference from a DC train passing in the vicinity of the line.



(6) This illustration shows off-potentials more negative than 1.2 volts which could cause the production of excessive hydrogen that can attack both the and the pipe.

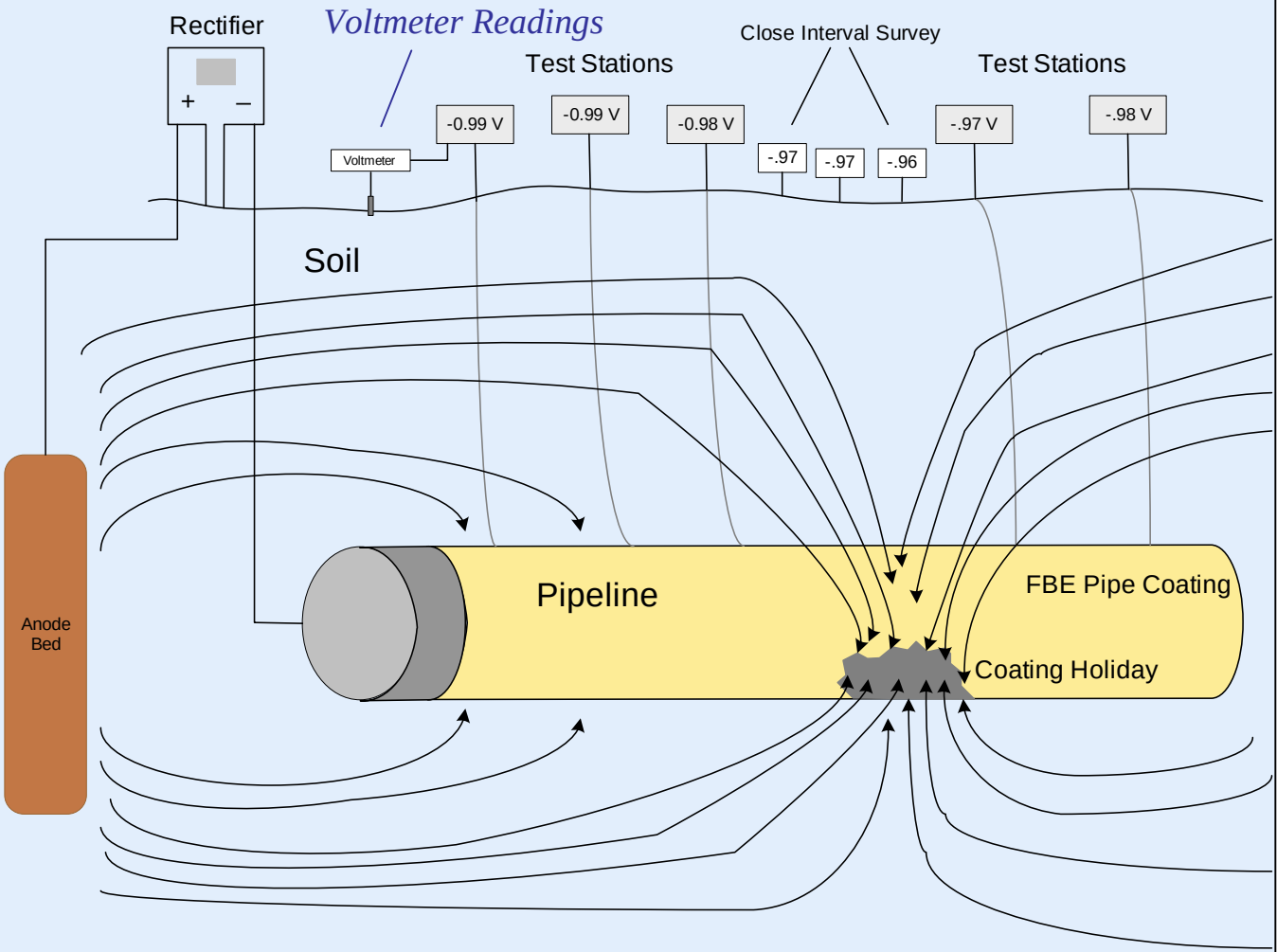




CP System: well coated pipe

- No anomalies
- No interference
- Consistent pipe to soil potentials

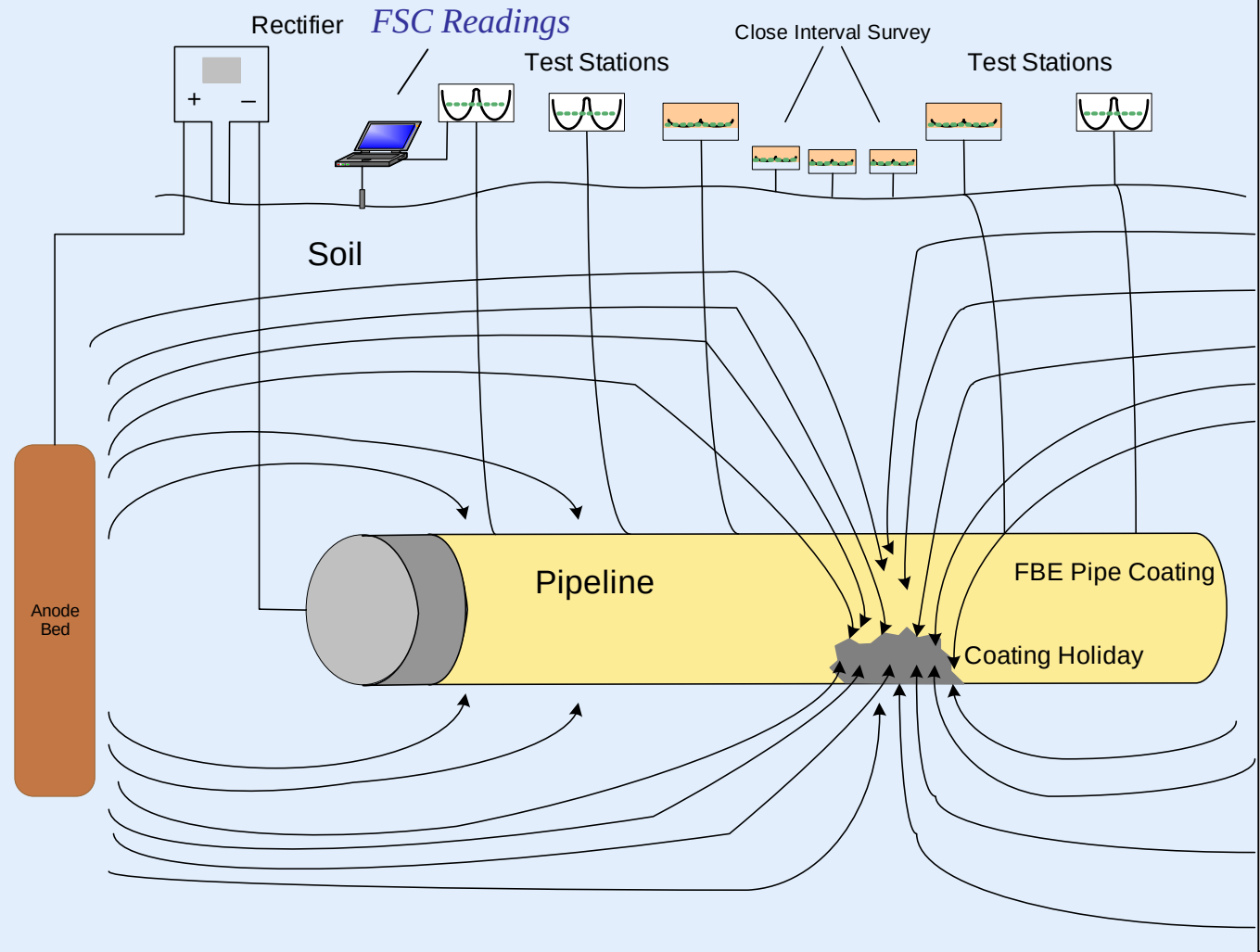
EUPEC RMS RISK MANAGEMENT SYSTEMS



CP System: coated pipe with Holiday

- Hole in coating
- Pipe exposed
- No interference
- Inconsistent pipe to soil potentials

EUPEC RMS RISK MANAGEMENT SYSTEMS

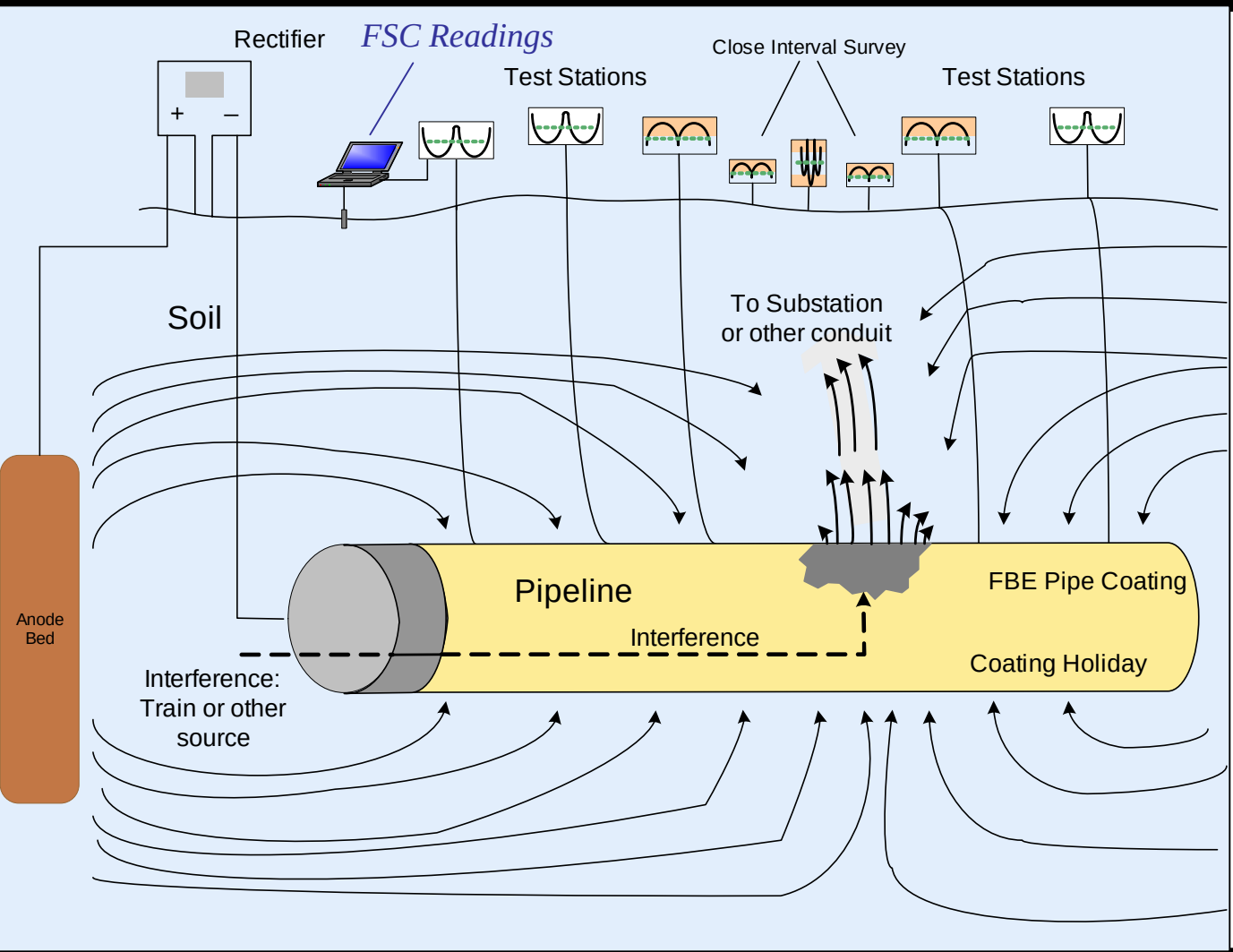


EUPEC RMS CP Signal Analysis:

- Holiday
- No interference
- Inconsistent pipe to soil potentials more efficiently identified with amplitude shift and decibel change.

FSC = Field Survey Computer

EUPEC RMS RISK MANAGEMENT SYSTEMS



EUPEC RMS
CP Signal Analysis:

- Holiday
- Interference present
- Interference identified with signal characteristic change.

EUPEC RMS

Field Service Computer (FSC)

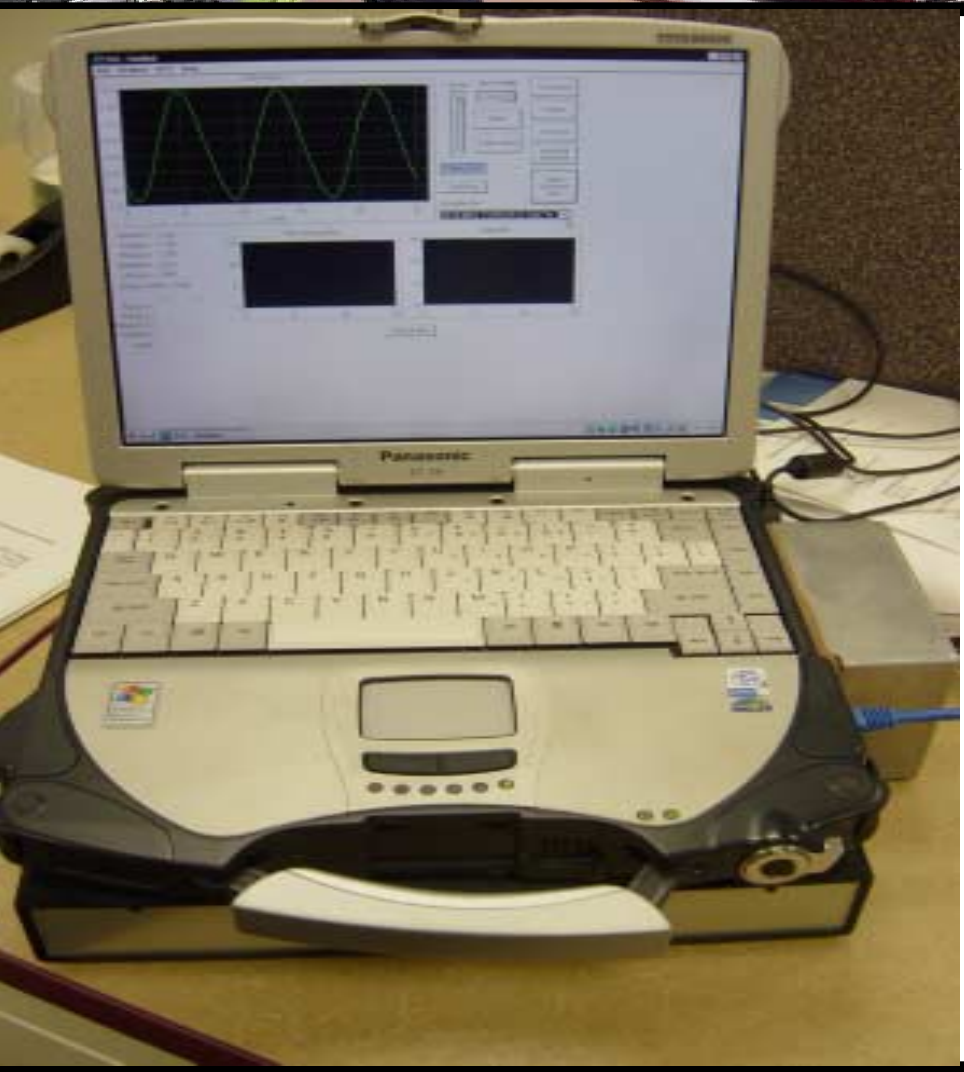
- **Extensive processing of data.**
- **Captures entire CP signal.**
- **Analyzes change.**
- **Identifies holidays.**
- **Spectrum analysis**
- **Identifies interference.**

EUPEC RMS

Delta Survey

- **Utilizes EUPEC RMS FSC.**
- **Identifies waveform.**
- **Also uses PSM, SCM, & soil resistivity**
- **Analyzes change.**
- **Identifies holidays.**
- **Identifies interference.**

EUPEC RMS RISK MANAGEMENT SYSTEMS

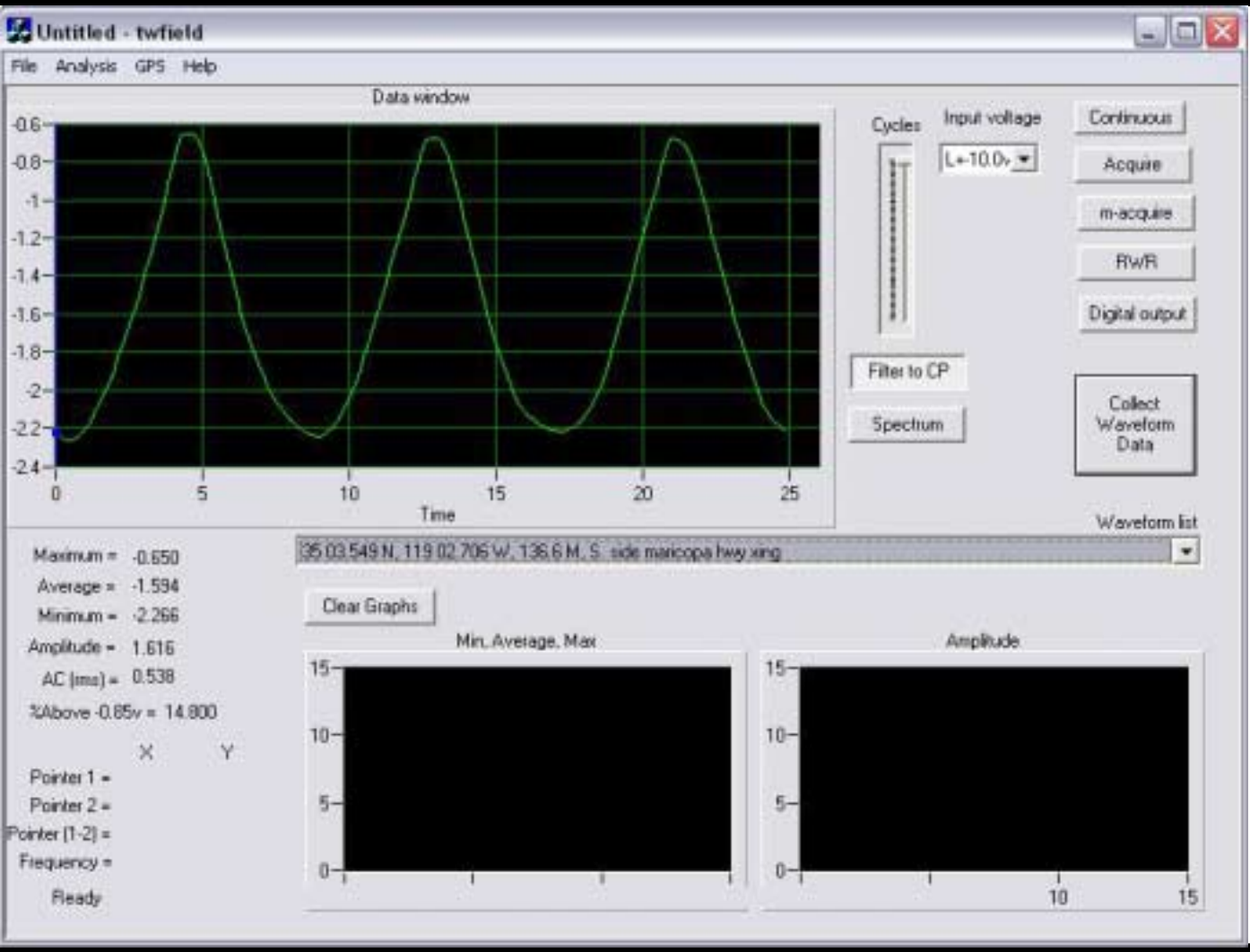


EUPEC RMS

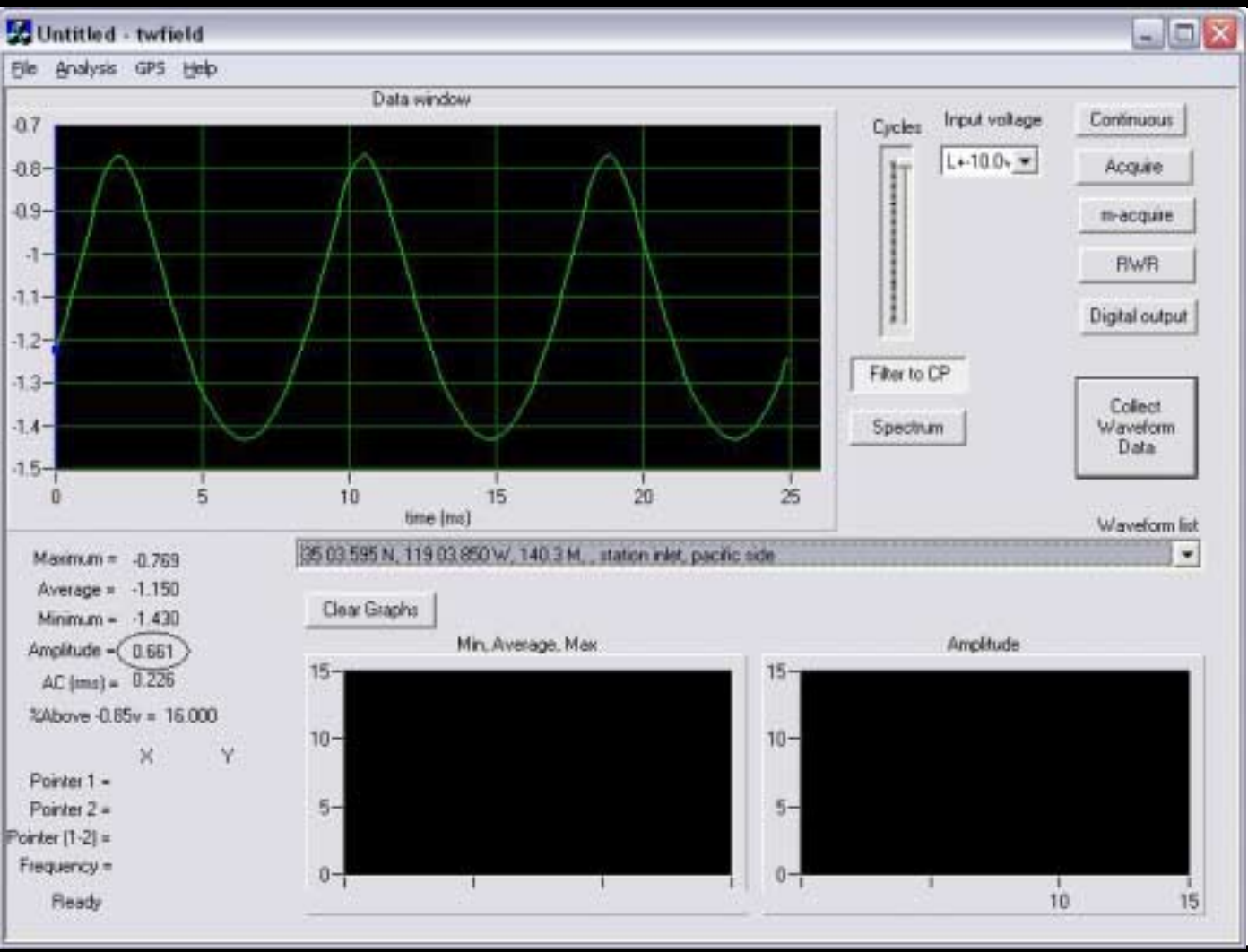
Field Survey Computer

- **Monitors more than single average**
- **Extensive processing of data**
- **Improved anomaly identification**
- **Spectrum Analysis**
- **Improved Interference Identification**
- **Direct assessment assistance**
- **Improved compliance**

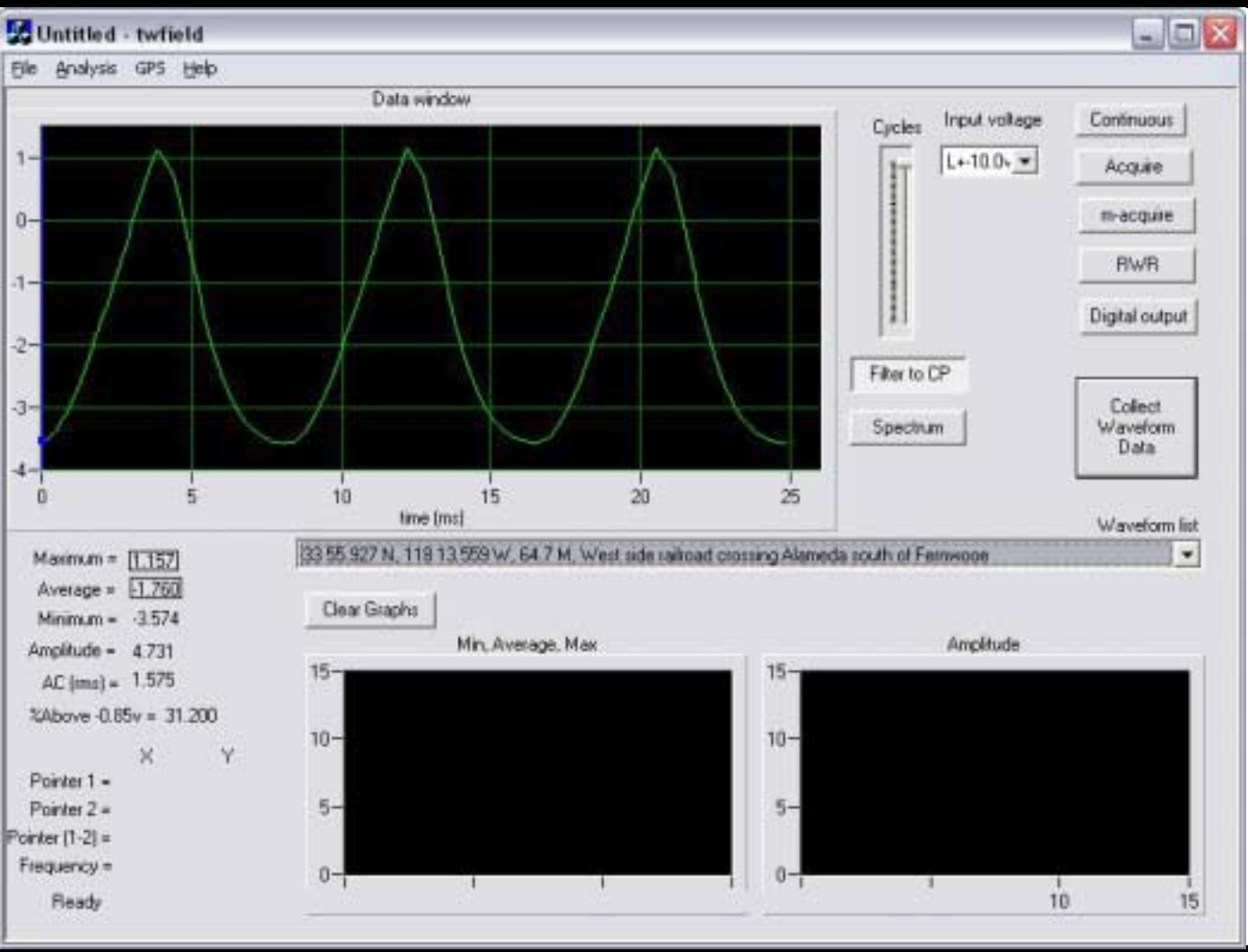
EUPEC RMS
RISK MANAGEMENT SYSTEMS



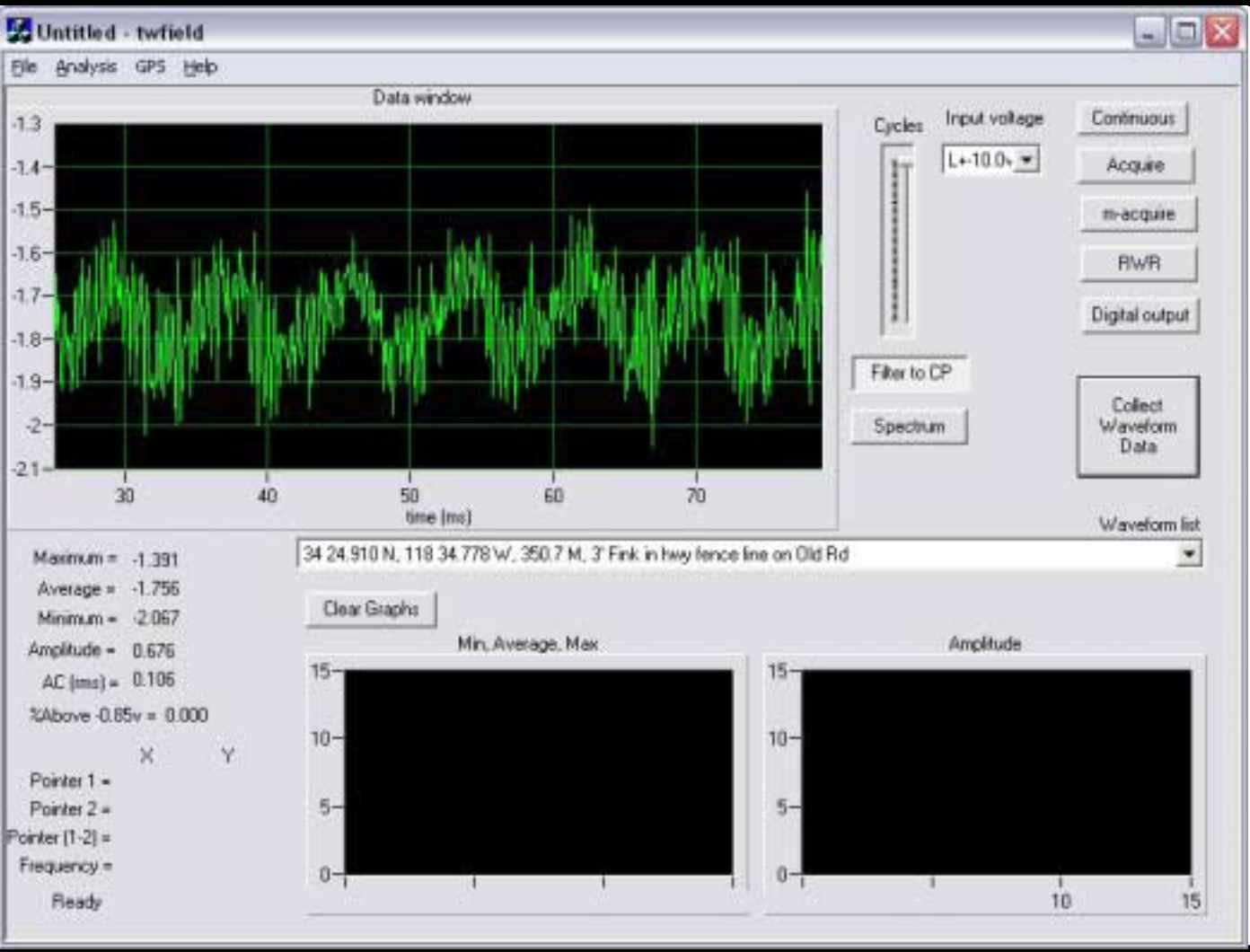
EUPEC RMS FSC with Good Signal



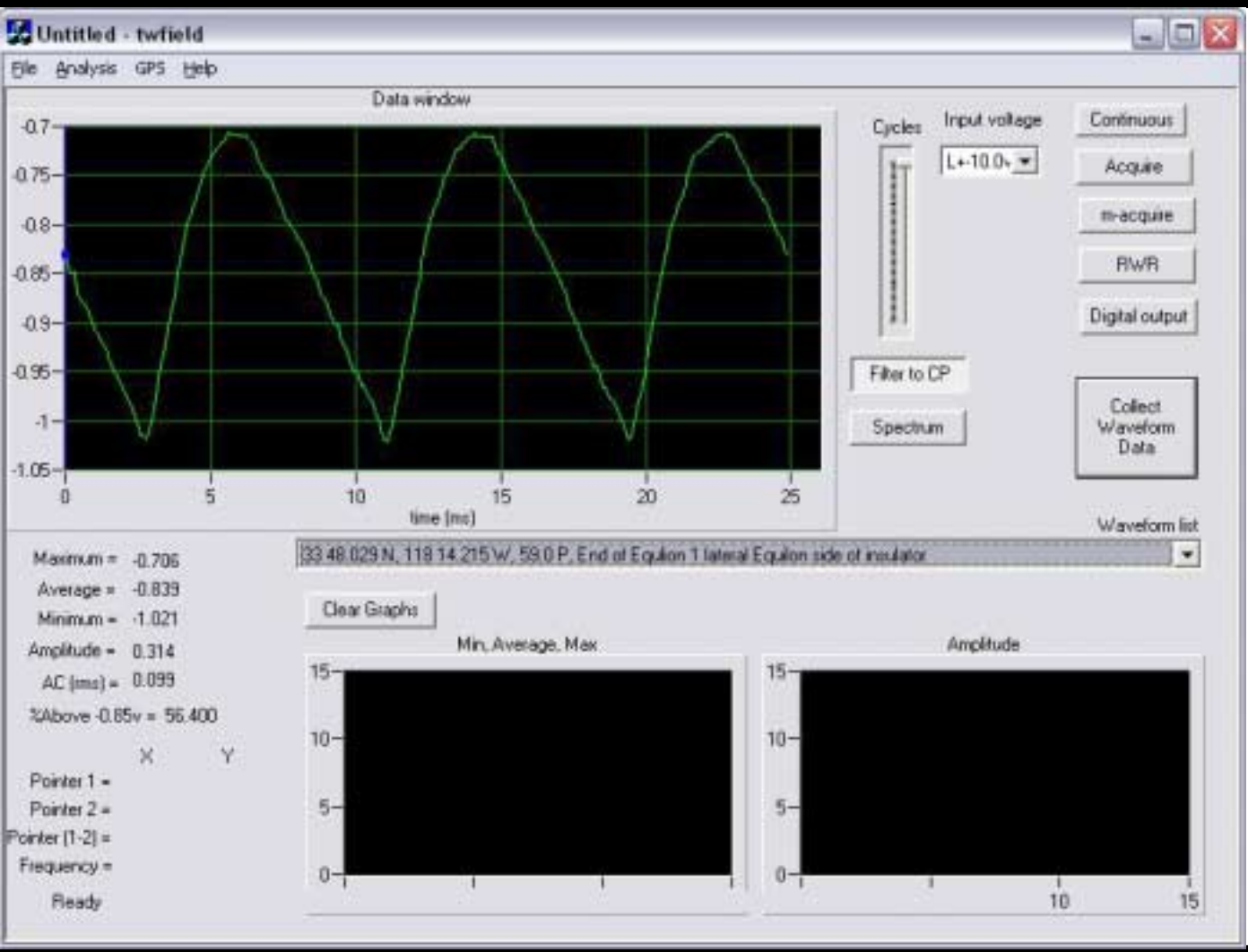
EUPEC RMS FSC with Anomaly Indication



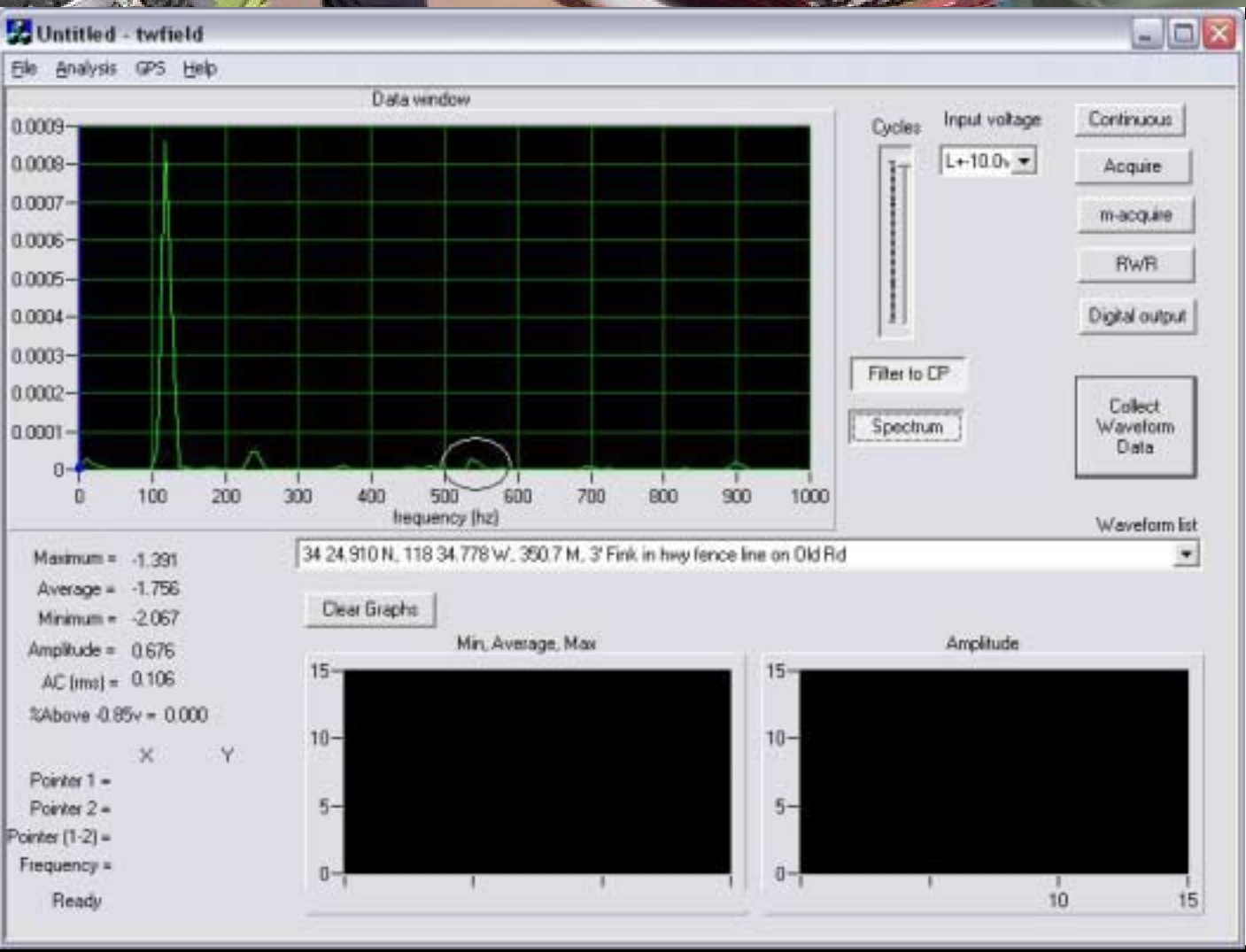
EUPEC RMS FSC with Positive Spiking



EUPEC RMS FSC with Interference Waveform

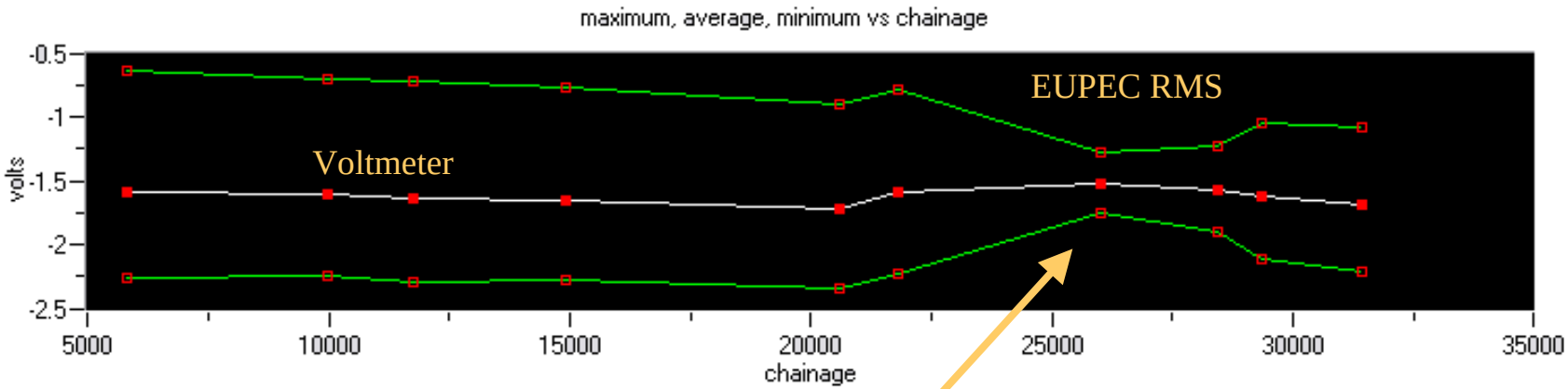


EUPEC RMS FSC with Inverted Waveform



EUPEC RMS FSC with Spectrum Analysis

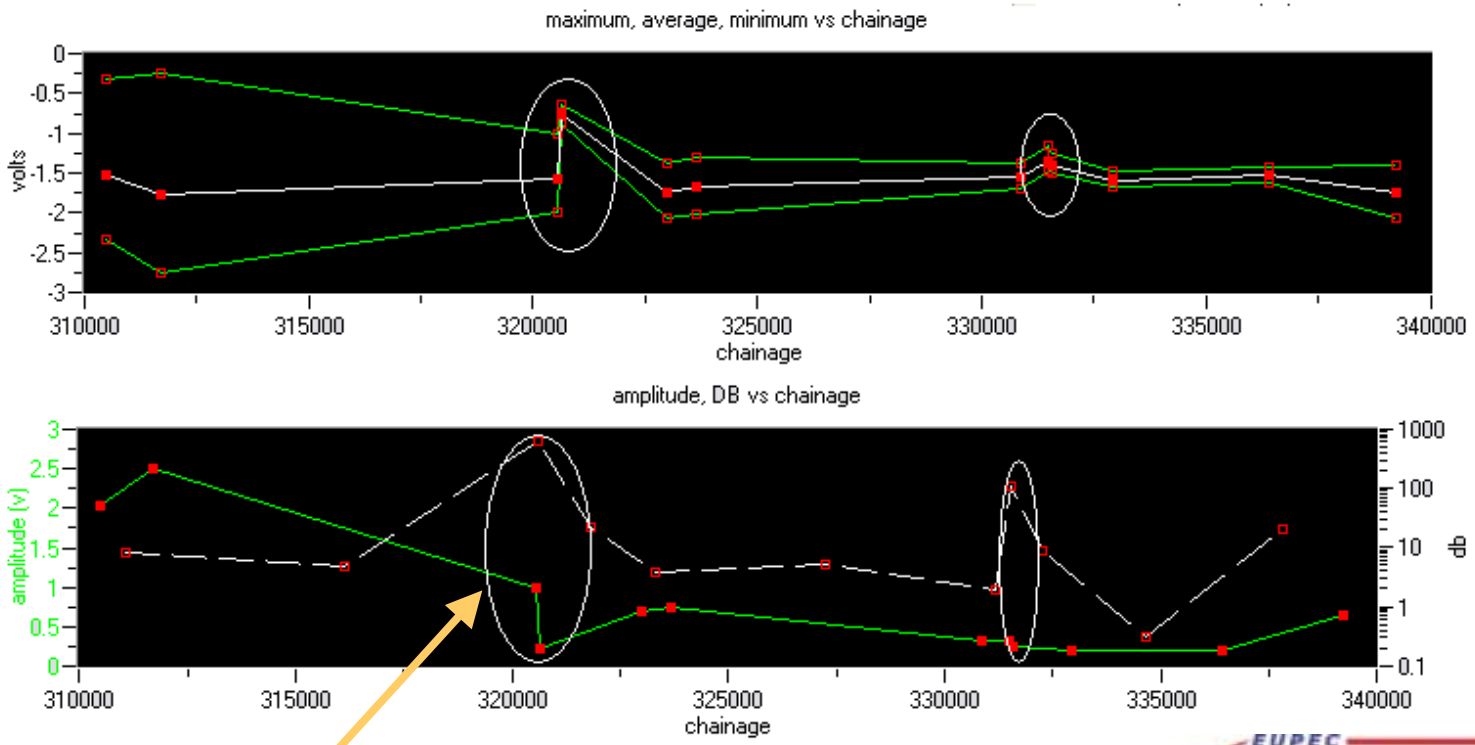
CP Signal Analysis with amplitude shift



Potential Holiday

- Delta amplitude provides more clarity than delta average

CP Signal Analysis with Amplitude Shift and dB change



Amplitude & dB change confirm holiday

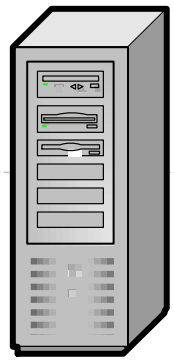
EUPEC RMS RISK MANAGEMENT SYSTEMS

EUPEC RMS

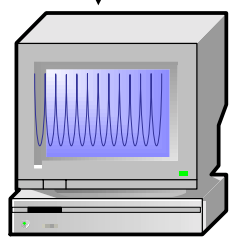
ATIS Remote Monitoring Unit

- **Monitors waveform and parameters**
- **Transmits data to server**
- **Automatic parameter based alarms**
- **Multiple communications means**
- **Ideal for High Consequence Areas**
- **Component of RMS 7/24 system**

EUPEC RMS
RISK MANAGEMENT SYSTEMS



Server



EUPEC Data Analysis

EUPEC RMS

Pipeline Integrity Analysis

- **EUPEC RMS FSC or RMU.**
- **Captures entire CP signal.**
- **Analyzes change.**
- **Identifies holidays.**
- **Identifies interference.**

EUPEC RMS RISK MANAGEMENT SYSTEMS

EUPEC RMS
Pipe Test Field
Pueblo, Colorado

4 pipes up to 250’.

Bare, FBE, (3-layer PE coming soon.)

Each pipe rectified.

Casing short, anomalies, interference.

EUPEC Pipeline Risk Assessment

CONCLUSIONS

1- Full wave form analysis allows a view of 360 degrees of pipe.

2- No loss of data through signal averaging such as with a volt meter.

3- More information faster since the equivalent of two surveys at once.

4- Ability to go test point to test point prioritizing segments for CIS.

EUPEC RMS RISK MANAGEMENT SYSTEMS

EUPEC Pipeline Risk Assessment

THANK YOU

EUPEC RMS RISK MANAGEMENT SYSTEMS